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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/574,507	09/05/2006	Jianjun Wang	047911-0103	2372

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WASHINGTON, DC 20007

EXAMINER

MEKHLIN, ELI S

ART UNIT	PAPER NUMBER
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1728

MAIL DATE	DELIVERY MODE
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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/574,507	Applicant(s) WANG ET AL.	
	Examiner ELI S. MEKHLIN	Art Unit 1728	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 57-60 and 62-80 is/are pending in the application.
- 4a) Of the above claim(s) 65-74, 77 and 78 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 57-60, 62-64, 75, 76, 79 and 80 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

(1)

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 23, 2010, has been entered. No new matter has been entered.

In this submission, Applicant added claims 79 and 80. Claims 57-60, 62-76, 79 and 80 are pending before the Office for review. Claims 65-74 are withdrawn from consideration as being directed to a non-elected invention.

(2)

Response to Arguments

Applicant's arguments with respect to claims 57-60, 62-64, 75 and 76 have been considered but are moot in view of the new ground(s) of rejection.

(3)

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 57-59, 75 and 79 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al., *Adv. Mater.* **2002**, 14, No. 1, January 4, Pages 64-67 in view of Mack et al. (U.S. Publication No. 2003/0224168).

With respect to **claim 57**, Wu teaches a plurality of carbon nanowalls (nanosheets) grown on a substrate wherein the plurality of nanowalls are aligned and stand on their edges vertically to the substrate. Page 64, Col. 2, Second Paragraph and Figure 1b. Wu further teaches that the thickness of the nanowall, which is also described as a flake, is less than 10 nanometers. Page 65, Bottom of First Full Paragraph. As per the MPEP, “where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. MPEP 2144.05(I) (internal quotations omitted).

Additionally, the Federal Circuit has made clear that “where the only difference between the prior art and the claims [is] a recitation of the relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device [is] not distinct from the prior art device.” MPEP 2144.04(IV)(A).

Furthermore, Mack, which deals with carbon nanosheets, teaches that carbon nanosheets can have a thickness of 3.4 Angstroms (0.34 nm) and that such a thickness makes the nanosheet useful in applications requiring a high surface area. Paragraphs 10 and 54.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention to configure the nanowalls taught by Wu into the size ranges

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taught by Mack because Mack teaches that carbon nanosheets at those dimensions have desirable properties due to their high surface area. Paragraphs 10 and 54.

With respect to **claim 58**, Wu teaches that the nanowall can be an unfolded single layer. Page 65, Col. 2, Middle First Full Paragraph. Additionally, with respect to the thickness, Wu teaches that the thickness of the nanowall, which is also described as a flake, is less than 10 nanometers. Page 65, Bottom of First Full Paragraph. As per the MPEP, “where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. MPEP 2144.05(I) (internal quotations omitted).

Additionally, the Federal Circuit has made clear that “where the only difference between the prior art and the claims [is] a recitation of the relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device [is] not distinct from the prior art device.” MPEP 2144.04(IV)(A).

Finally, Mack teaches that the nanosheet can be 0.34 nm thick and comprise an individual (one) graphite (graphene) layer. Paragraph 54 and Claim 14.

With respect to **claim 59**, Wu teaches that the nanowall can be an unfolded single layer. Page 65, Col. 2, Middle First Full Paragraph. Additionally, Mack teaches that the nanosheets comprise an individual (one) graphite (graphene) layer. Paragraph 54 and Claim 14.

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With respect to **claim 75**, Wu teaches that the nanowalls are useful in catalyst materials. Page 67, Col. 1, First Paragraph. Additionally, Mack teaches that the nanosheets are useful in hydrogen absorption. Paragraph 10.

With respect to **claim 79**, Wu teaches that the Raman spectra of the nanowalls have a peak at 1335 cm^{-1} , which is consistent with a finding that the nanowalls comprise crystalline nanowalls. Page 65, Col. 2, Bottom of the First Full Paragraph.

(4)

Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al., *Adv. Mater.* **2002**, 14, No. 1, January 4, Pages 64-67 in view of Mack et al. (U.S. Publication No. 2003/0224168), as applied to claims 57-59, 75 and 79 above, and further in view of Peigney et al. *Carbon*, (39) 2001 505-514.

With respect to **claim 60**, Wu and Mack, as combined above, teach carbon nanowalls with lateral dimensions of between 1 to 2 micrometers (which is within the claimed range of 100 nm to 8 micrometers) and that the carbon nanosheet comprises individual graphite layers, meaning the nanosheet is in substantially pure form. Mack, Col. 14, Claim 16.

Additionally, it would have been obvious to a person having ordinary skill in the art at the time of invention that the specific surface area is based on the dimensions of the nanosheet and its mass. Wu and Mack, as combined above, teach a substantially pure nanowall that has identical dimensions to the claimed nanosheet. Accordingly, because the nanowall is the same material and same dimensions as the claimed nanosheet, it necessarily has the same specific surface area. Specifically, the specific

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surface area is presumed because both Wu and Mack and the claimed nanosheet are formed of the same material, are both in substantially pure form and both have the same dimensions. Accordingly, the nanowalls taught by the combination of Wu and Mack would be expected to have a specific surface area within the claimed range.

Moreover, it would be obvious to a person having ordinary skill in the art at the time of invention that the specific surface area, which is a function of the surface area of an object and its mass can be varied to achieve a desired result. Specifically, a person having ordinary skill in the art at the time of invention would have appreciated that the length, width, height or mass of an object could be manipulated (increased or decreased) to manipulate (increase or decrease) the obtained specific surface area. Accordingly, as per the MPEP, “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” MPEP 2144.05(II)(A). Moreover, a person having ordinary skill in the art at the time of invention would make this modification because Wu teaches that the nanowalls are useful in applications requiring high surface area materials. Page 67, Col. 1, First Paragraph.

Additionally, Peigney, which deals with carbon nanostructured materials, teaches that such carbon materials would be expected to have a specific surface area within the claimed range of $1,000 \text{ m}^2/\text{g}$ to $2,600 \text{ m}^2/\text{g}$. Page 508, Col. 2, SSA(SWNT). Specifically, in one example, Peigney teaches that the specific surface area of a SWNT is that of one side of a graphene sheet and that the SSA is $1315 \text{ m}^2/\text{g}$, which is within

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the claimed range. Page 508, Col. 2, SSA(SWNT). Thus, the graphene sheet taught by Wu and Mack, as combined above, would be expected to have the same SSA.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention that the nanowalls taught by Wu and Mack, as combined above, would have an SSA within the claimed range because Wu and Mack teach a nanowall that is made of the same material and has the same dimensions as the claimed invention, meaning SSA, which is based on surface area (length, width height) and mass would be expected to be the same. Additionally, all the parameters used to calculate SSA are result effective variables that can be optimized to obtain a SSA in the desired range. Finally, Peigney, which is a study of nanostructured carbon materials, teaches that a graphene sheet would be expected to have an SSA of $1315 \text{ m}^2/\text{g}$.

(5)

Claims 62, 63, 76 and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al., *Adv. Mater.* **2002**, 14, No. 1, January 4, Pages 64-67 in view of Peigney et al. *Carbon*, (39) 2001 505-514.

With respect to **claim 62**, Wu teaches a plurality of carbon nanowalls (nanosheets) grown on a substrate wherein the plurality of nanowalls are aligned and stand on their edges vertically to the substrate. Page 64, Col. 2, Second Paragraph and Figure 1b. Wu teaches that the nanowall can be described as a flake. Page 65, Bottom of First Full Paragraph.

Additionally, it would have been obvious to a person having ordinary skill in the art at the time of invention that the specific surface area is based on the dimensions of

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the nanosheet and its mass. Wu, as explained above, teaches a flake nanowall that meets the compositional requirements of the claimed invention, meaning the nanowall taught by Wu would be expected to have the same density as that of the claimed nanoflake. Accordingly, it would be obvious to a person having ordinary skill in the art at the time of invention that the specific surface area, which is a function of the surface area of an object and its mass can be varied to achieve a desired result. Specifically, a person having ordinary skill in the art at the time of invention would have appreciated that the length, width, height or mass of an object could be manipulated (increased or decreased) to manipulate (increase or decrease) the obtained specific surface area. Therefore, because Wu teaches a nanoflake with the same density as the claimed invention, the length, width and height of the nanoflake taught by Wu could be varied along with the mass to obtain a nanoflake with the desired specific surface area. Accordingly, as per the MPEP, “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” MPEP 2144.05(II)(A). Moreover, a person having ordinary skill in the art at the time of invention would make this modification because Wu teaches that the nanowalls are useful in applications requiring high surface area materials. Page 67, Col. 1, First Paragraph.

Additionally, Peigney, which deals with carbon nanostructured materials, teaches that such carbon materials would be expected to have a specific surface area within the claimed range of $1,000 \text{ m}^2/\text{g}$ to $2,600 \text{ m}^2/\text{g}$. Page 508, Col. 2, SSA(SWNT).

Specifically, in one example, Peigney teaches that the specific surface area of a SWNT

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is that of one side of a graphene sheet (equivalent to Wu's nanowall) and that the SSA is $1315 \text{ m}^2/\text{g}$, which is within the claimed range. Page 508, Col. 2, SSA(SWNT). Thus, the graphene sheet taught by Wu would be expected to have the same SSA.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention that the nanowalls taught by Wu would have an SSA within the claimed range because Wu teaches a nanowall that is made of the same material as the claimed invention, meaning SSA, which is based on surface area (length, width height) and mass would be expected to be the same can be obtained by optimizing the nanowall to a desired length, width or height. Finally, Peigney, which is a study of nanostructured carbon materials, teaches that a graphene sheet would be expected to have an SSA of $1315 \text{ m}^2/\text{g}$.

With respect to **claim 63**, Wu further teaches that the thickness of the nanowall, which is also described as a flake, is less than 10 nanometers. Page 65, Bottom of First Full Paragraph. As per the MPEP, "where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. MPEP 2144.05(I) (internal quotations omitted).

With respect to **claim 76**, Wu teaches that the nanowalls are useful in catalyst materials. Page 67, Col. 1, First Paragraph.

With respect to **claim 80**, Wu teaches that the Raman spectra of the nanowalls have a peak at 1335 cm^{-1} , which is consistent with a finding that the nanowalls comprise crystalline nanowalls. Page 65, Col. 2, Bottom of the First Full Paragraph.

(6)

Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al., *Adv. Mater.* **2002**, 14, No. 1, January 4, Pages 64-67 in view of Peigney et al. *Carbon*, (39) 2001 505-514, as applied to claim 62, 63, 76 and 80 above, and further in view of Mack et al. (U.S. Publication No. 2003/0224168).

With respect to **claim 64**, Wu and Peigney, as combined above, establish that the parameters of the nanoflake (height, width, length) can be optimized to obtain a nanoflake with the desired specific surface area. Col. 1, First Paragraph. Accordingly, as per the MPEP, “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” MPEP 2144.05(II)(A). Moreover, a person having ordinary skill in the art at the time of invention would make this modification because Wu teaches that the nanowalls are useful in applications requiring high surface area materials. Page 67, Col. 1, First Paragraph.

With respect to the thickness of the nanoflake, Wu teaches that the thickness of the nanowall is less than 10 nanometers. Page 65, Bottom of First Full Paragraph. As per the MPEP, “where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. MPEP 2144.05(I) (internal quotations omitted).

Additionally, the Federal Circuit has made clear that “where the only difference between the prior art and the claims [is] a recitation of the relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform

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differently than the prior art device, the claimed device [is] not distinct from the prior art device.” MPEP 2144.04(IV)(A).

Furthermore, Mack, which deals with carbon nanosheets, teaches that carbon nanosheets can have a thickness of 3.4 Angstroms (0.34 nm) and that such a thickness makes the nanosheet useful in applications requiring a high surface area. Paragraphs 10 and 54.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention to configure the nanowalls taught by Wu and Peigney, as combined above, into the size ranges taught by Mack because Mack teaches that carbon nanosheets at those dimensions have desirable properties due to their high surface area. Paragraphs 10 and 54.

(7)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELI S. MEKHLIN whose telephone number is (571)270-7597. The examiner can normally be reached on 5/4/9.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer K. Michener can be reached on 571-272-1424. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ELI S MEKHLIN/
Examiner, Art Unit 1728

/Jennifer K. Michener/
Supervisory Patent Examiner, Art Unit 1728